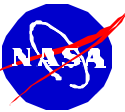




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Space Shuttle Program (SSP)

Summary of Waiver Review

STS-114 Flight Readiness Review

N. Wayne Hale, SSP Deputy Manager
Gregory C. Johnson, Manager, Launch Integration
June 29-30, 2005

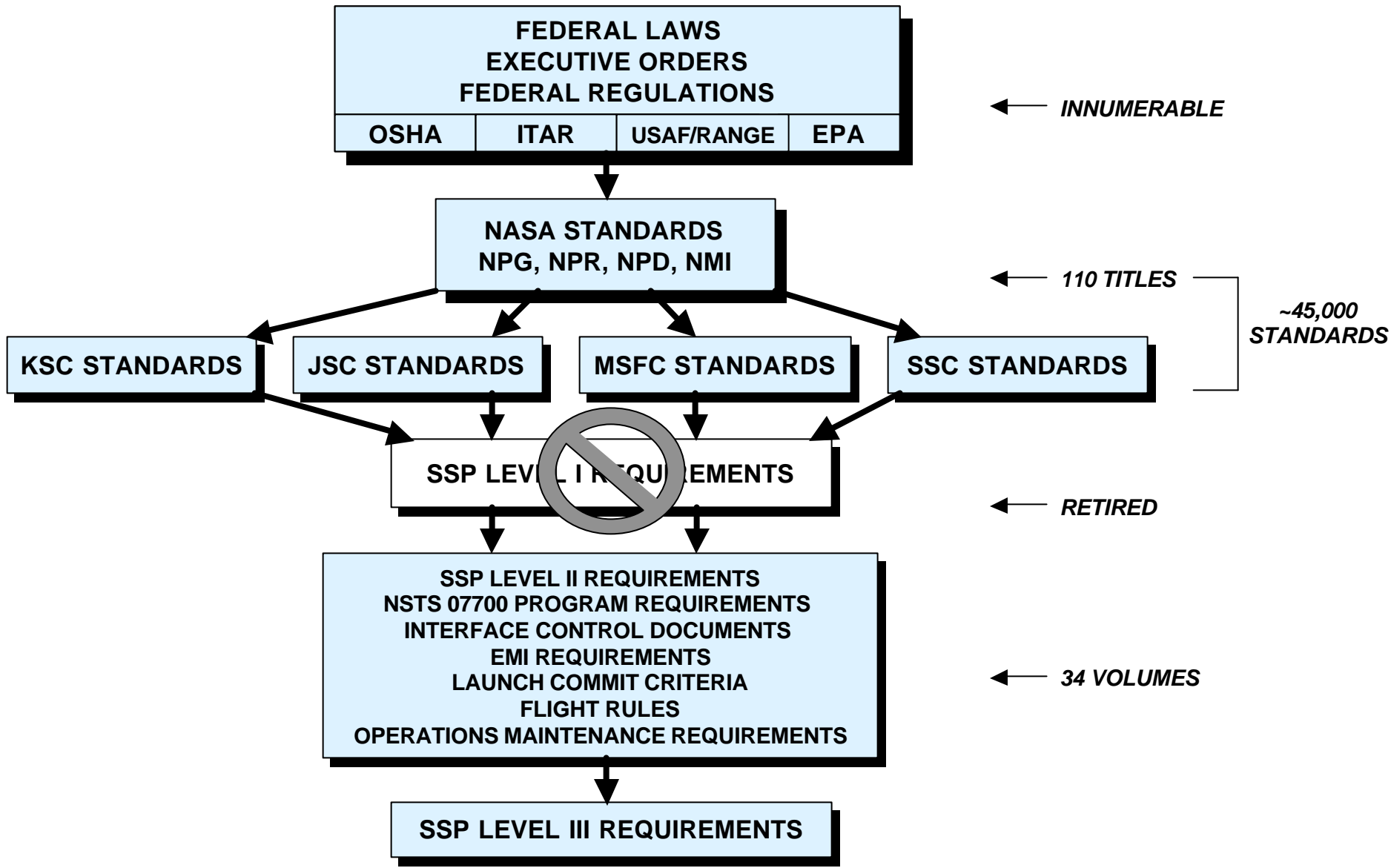


Origins of Standards and Requirements

Presenter **W. Hale/G. Johnson**

Date **June 29-30, 2005**

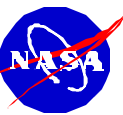
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Waiver Review

Presenter

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Date

June 29-30, 2005

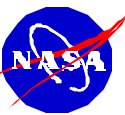
Page 3

- Total pre STS-107 waivers/deviations/exceptions: 6467
 - Of this total, 5812 were CIL waivers (not included in review)
- The waiver review began with 655 waivers
- Of this total, 313 waivers were EMI (SL-E-0002) waivers which were reviewed by the Engineering Directorate
- As of 6/27/05, 342 waivers have been reviewed at the Daily PRCB
 - Retained: 81
 - Identified for retirement/inactive: 261



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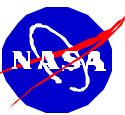
Page 4

- **CM reviewed all 252 waivers, deviations, exceptions and exceedances identified as retired.**
 - 70 were confirmed as retired in documents and in WEBPCASS.
 - 43 have CR's submitted and PRCBD's in work to retire.
 - 95 are inactive exceedances in Payload ICD's.
 - 44 are waivers and exceptions identified for retirement for which paperwork has not been submitted yet.



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Waiver Review

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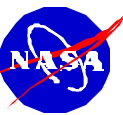
• Waiver Retirements by Category:

- 20 Requirement Change
- 17 Requirement Met
- 10 Hardware Redesign
- 29 Hardware No Longer in Service
- 4 Waivers retired and rewritten
- 15 Expired Effectivity
- 95 Inactive P/L ICD waivers
- 1 Equipment Certified



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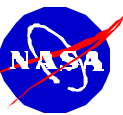
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- **Categories of Waivers Retained after Program Review:**
 - **Hardware/software not built to specification - 16**
 - **Soldering requirements not met - 5**
 - **Parts traceability (EEE/non-EEE) – 5**
 - **Requirements changed – 8**
 - **Platform clearance – 5**
 - **Factor of Safety, GSE Structures – 2**
 - **Requirement met via alternate method – 6**
 - **Wiring/Electrical – 14**
 - **Configuration waiver – 2**
 - **Requirements cannot be met – 4**
 - **Procurement specification violation – 2**
 - **Government Source Inspection (GSI) missed – 3**
 - **Lack of documentation – 3**
 - **Certification – 1**



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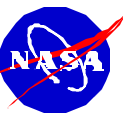
Page **7**

- **A total of 313 waivers are open EMI (SL-E-0002) waivers which were reviewed by the Engineering Directorate and the E3 Panel.**
 - **201 waivers identified for retirement**
 - **112 waivers recommended for retention, subsequent to the planned process change**
- **The EMI community is proposing a change to the SL-E-0002 document that would allow most of these waivers to be retired.**



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Change to CIL Waiver Process

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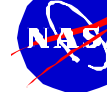
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- **CIL waiver evaluation by Program in 2004 resulted in the elimination of CIL waivers from Program documentation.**
- **Benchmark against other high-reliability organizations (e.g., ISS, DoD) found that CIL waivers were not used.**
- **PRCB determined that CIL waivers only duplicated the CIL retention rationale and added little value to Program risk management.**
- **Elimination of CIL waivers enhanced overall technical waiver process by not obscuring remainder of technical risks with well defined and controlled risks as captured in the CILs.**



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RTF WAIVER/EXCEPTION REVIEW

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- **48 New RTF Waivers/Exceptions Approved**
- **2 Waivers Pending Approval**

Hardware/Software not built to specification - 4

Soldering requirements not met - 3

Requirement changed - 6

Factor of Safety, GSE Hardware - 5

Factor of Safety-Flight Hardware - 7

EMI - 1

Requirement met via alternate methods - 5

Configuration waiver - 1

Requirement cannot be met - 3

Government Source Inspection (GSI) missed - 1

Lack of proper documentation - 1

Uncertified GSE - 10

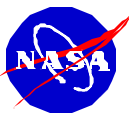
ESDS markings problems – 2

Other – 1



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Summary – Why Waivers Matter

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- **If a departure from the requirements has occurred and it is impractical for whatever reason to return to the requirements, then it is imperative that good technical rationale for safety be understood.**
- **A consistent, rigorous program for creating, managing, and dispositioning waivers is critical for the Program to understand the risk it is accepting when deviating from requirements.**
- **In all, the total number of active, current waivers in the space shuttle program has been decreased by about 90% - from over 5,000 to less than 500.**
- **Unlike the previous large number, the smaller number of active waivers is one that program management can effectively review, periodically status, and provide resources to eliminate.**
- **The result is a better insight into the risk present in the Space Shuttle system**



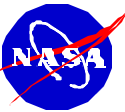
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BACK-UP



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Waiver Review Action

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PRCB Action S064057, Action 1-1: Raising the Bar (SSP-6)

Review all waivers, deviations, and exceptions to program baseline requirements. Verify validity and acceptability. Report results to PRCB. (Return to Flight Constraint)

- Assigned to Daily PRCB May 15, 2003
- Clarified scope by Manager, Launch Integration: MK memorandum dated June 3, 2003
- Elements reported to the Daily PRCB on their recommendations for each waiver, deviation, or exception (excluding CIL waivers)
- Any new waiver issued after mid-2003 is considered to have the proper rigor in its evaluation and was not included in this waiver review.



Requirements Review Examples

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Examples where requirements are inappropriately strict leading to unnecessary numbers of waivers

Payload clearance Interface Control Document (ICD)

- 87 inch cylinder in payload bay is required
 - Payload bay is actually 90 inches in diameter
- Actual requirement is no contact
- Technical analysis must prove no contact
- Rewrite of the requirement will result in same analysis but no waiver

Electromagnetic Interference (EMI)

- Any emitter violates requirement
- Waivers document analysis to prove no hazard
- Requirement should be no hazard
- Rewrite of the requirement will result in same analysis but no waiver



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Definition of Waiver, Deviation, and Exception

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Deviation	An SSP change will be designated as a deviation when the change is submitted, before the fact, to request authorization to depart from a particular specification requirement.	NSTS 07700, Volume IV-Book 1, Paragraph 4.3.8 Configuration Management Requirements
Waiver	An SSP change will be designated as a waiver when the change is submitted, after the fact, requesting authorization to use or accept an article or condition that does not meet specified requirements	NSTS 07700, Volume IV-Book 1, Paragraph 4.3.8 Configuration Management Requirements
Waiver	A written authorization to accept designated items which, during production or after having been submitted for inspection, are found to depart from specified requirements, but nevertheless are considered suitable for use "as is" or after rework by an approved method.	NSTS 07700, Volume IV-Book 1, Appendix B Configuration Management Requirements
Deviation	A specific authorization, granted before the fact, to depart from a particular baseline requirement for a limited application.	NSTS 07700, Volume IV-Book 1, Appendix B Configuration Management Requirements
Deviation	A specific authorization granted before the fact to depart from a particular requirement or specifications or related document.	NSTS 07700, Volume XI, Appendix B System Integrity Assurance Program Plan
Exception	Authorizing directions not to comply with specific requirement(s) as the result of formal board action (Configuration Control Board [CCB], PRCB, MRB, etc.)	NSTS 07700, Volume XI, Appendix B System Integrity Assurance Program Plan
Waiver	The granted use or acceptance of an article which does not meet specific requirements; a waiver is given or authorized after the fact.	NSTS 07700, Volume XI, Appendix B System Integrity Assurance Program Plan



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Definition of Waiver, Deviation, and Exception

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Exception	Authorizing directions not to comply with specific requirement(s) as the result of formal board action (Configuration Control Board [CCB], Program Requirements Control Board [PRCB], Material Review Board [MRB], etc.)	NSTS 07700, Volume XII, Appendix B Program Logistics and Supportability
Waiver	A waiver is a program approval for acceptance of an IDMRD non-compliance against a specific hardware serial number. A waiver is not required: a. If a Maintenance Change Notice (MCN) is processed and approved to allow non-compliance to fall within the limits of the revised requirement; b. If the discrepant hardware is corrected and a subsequent retest is successful.	NSTS 08151, Volume I, Section 9 IDMRD Maintenance Concepts Baseline, Paragraph 9.1.1
Exception	An exception is a pre-approved program authority to defer, deviate from, vary, change, and/or not perform a specified IDMRD requirement when performing acceptance of a specified hardware serial number. An exception is not required when less than full Acceptance Test Procedure (ATP) is authorized by means of a Depot Maintenance Retest Disposition (Reference NSTS 08151, Volume II).	NSTS 08151, Volume I, Section 9 IDMRD Maintenance Concepts Baseline, Paragraph 9.1.2



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Definition of Waiver, Deviation, and Exception

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Exception/ Waiver	An exception/waiver is a temporary change to the content of the OMRSD which provides a detailed description of the change and is utilized as a risk management vehicle and to document deviations from the OMRSD. Unlike RCNs, exceptions/waivers do not physically change the technical content of an OMRS requirement in the text file, they only modify the exception/waiver logs associated with the affected OMRSD text file.	NSTS 08171 – Paragraph 6.5, OMRSD Noncompliance Policy
Waiver	An OMRS waiver is a post –occurrence approval and documentation of not fulfilling an OMRS requirement as specified. It includes deferring, deviating from, and/or not performing a requirement including the constraints, hardware or time limiting cautions and warnings, and general requirements. A waiver may be requested with multiple effectivities (not to exceed an OMPD interval as defined in NSTS 07700, Volume III, Paragraph 3.2.A.2.A) if it is so annotated on the waiver request and the technical rationale adequately justifies noncompliance with the requirement as baselined for more than one flight. Request for a waiver to the OMRS requirements (including general requirements) may be submitted by an NASA or contractor.	NSTS 08171 – Paragraph 6.5.2, OMRSD Noncompliance Policy
Exception	An OMRS exception is a pre-occurrence approval (when substantiated by adequate technical rationale) to defer, deviate from, vary, change, and/or not perform an OMRSD requirement as specified. An exception may be requested with multiple effectivities (not to exceed an OMDP interval as defined in NSTS 07700, Volume III, Paragraph 3.2.A.2.A) if it is so annotated on the exception request and the technical rationale adequately justifies noncompliance with the requirement as baselined for more than one flight. Request for an exception to OMRSD requirements (including general requirements) may be submitted by any NASA or contractor.	NSTS 08171 – Paragraph 6.5.3, OMRSD Noncompliance Policy



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Definition of Waiver, Deviation, and Exception

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Waiver	A written authorization, granted after the fact, for use or acceptance of an article which does not meet the specified requirements.	NSTS 22206, Paragraph 3.2 Requirements for Preparation and Approval of FMEA/CIL
Waiver/ Deviation	The granted use or acceptance of an article that does not meet specified requirements. A waiver is given or authorized after the fact; a deviation is before the fact.	JSC 28035, Appendix B PRACA Requirement for JSC GFE
Waiver	An SSP change submitted after the fact requesting authorization to use or accept an article or condition that does not meet specified requirements.	NSTS 37369, Paragraph 10.1 SSP Electromagnetic Environmental Effects Control Plan
Deviation	An SSP change submitted before the fact to request authorization to depart from a particular specification requirement.	NSTS 37369, Paragraph 10.1 SSP Electromagnetic Environmental Effects Control Plan
Deviation	A change is designated as a deviation when the change is submitted before the fact to request authorization to depart from a particular specification requirement. A	NSTS 37400, Volume II, Appendix B SSP Upgrades Management Plan
Waiver	A change is designated as a waiver when the change is submitted after the fact requesting authorization to use or accept an article or condition that does not meet specified requirements.	NSTS 37400, Volume II, Appendix B SSP Upgrades Management Plan
Waiver	A written authorization to accept designated items which, during production or having been submitted for inspection, are found to depart from specifications, but nevertheless are considered suitable for use "as is."	SN-S-0008, Table 4.1 S/W Deliverable Data Package Requirement Specification
Deviation	A specific authorization granted before the fact to depart from a particular baseline requirement for a limited application.	SN-S-0008, Table 4.1 S/W Deliverable Data Package Requirement Specification